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Final



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AUG 3 1 1989  
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**Technical Support Document  
For Record Of Decision  
Tin City, AFS**

Prepared for

**USAF OEHL  
Brooks, AFB, Texas**

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February 29, 1988

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FINAL

INSTALLATION RESTORATION PROGRAM  
TECHNICAL SUPPORT DOCUMENT  
FOR RECORD OF DECISION  
TIN CITY AIR FORCE STATION  
LRRS SITE

Prepared for

USAF

Prepared By

Woodward-Clyde Consultants

701 Sesame Street

Anchorage, AK

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RECORD OF DECISION

Installation: The Tin City LRR Station is located near the western tip of the Seward Peninsula, along Norton Sound, Alaska. The area is surrounded by wet and alpine tundra typical of northern Alaska.

Scope of Decision: This record of decision and supplemental support document applies to six potential sites identified at Tin City. The recommendations for all six sites are the same; therefore, a single document for the entire installation is warranted.

Statement of Basis: The findings and decisions on the Tin City LRRS station presented in this document are based on the following:

- Phase 1 IRP study and report (Engineering Science, 1985).
- 1987 (August 25, 1987) site visit by personnel of Woodward-Clyde Consultants and the U.S. Air Force.
- Comprehensive literature search and review.
- Information gathered from governmental regulatory agencies and a review of active environmental permits issued by state and federal agencies. The following permit has been issued for sites identified during Phase I: Solid Waste Disposal Permit (Site 17).
- Review of the physical, chemical, and toxicological characteristics of suspected or known contaminants.

Tin City AFS

- Priority Assessment Form submitted by EPA (Jacques Gusmano).

Regulatory Agency Concerns:

No written comments on Tin City were received from ADEC or U.S. EPA which expressed concerns after the 1987 site visit. However, informal comments and suggestions from both agencies have been included in this document.

Description of Selected Remedy:

cont'd  
Information presented in this document supports a finding that there is no significant impact on human health or the environment from suspected or confirmed past contamination at the Tin City LRR station. The selected remedy is "No Further Action" with regard to investigation or cleanup of six (6) sites identified as possible areas of contamination at the Tin City LRR station.

- o For all six (6) sites at the Tin City LRR station, the risk of significant adverse effects to human health and the environment is negligible, acceptably low, or offset by other considerations.
- o Based on an evaluation of alternatives, any remedial action or further study would not significantly reduce the risks presently existing at each site, and the costs of such actions would not be offset by any significant benefits.
- o Remedial action or further study is not cost effective.

## Tin City AFS

### Declarations:

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended, and the National Contingency Plan Act (NCP) as amended, provide for Trustee and Regulatory Agencies to determine the appropriate actions at federal facilities where oil or hazardous substances may have been used or disposed.


Based on the best, currently available information at all six (6) sites at the Tin City LRR station, the risk of significant adverse effects to human health and the environment is negligible, acceptably low, or offset by other considerations. Such considerations include avoidance of environmental damage resulting from further investigations or cleanup. In all cases, further cleanup activities would create a disproportionate amount of damage, especially to the fragile tundra ecosystem, relative to the amount of contamination which could be recovered and to other derived benefits. Other considerations include the absence of significant exposure to human receptors. In summary, the "No Further Action" alternative will adequately protect public health, welfare, and the environment.

The Air Force determines that the recommended action is appropriate when balanced against the availability of Defense Environmental Restoration Act (DERA) or other monies for use at potentially contaminated sites. Specific attributes of the site that suggest or support the "No Further Action" alternative are as follows:

- o Intermittent permafrost may preclude the possibility of significant vertical migration of potential contaminants.

Tin City AFS

- o Human health risks are negligible.
- o Contamination was not observed at any site.
- o No threatened or endangered species are known to use or exist on the installation.
- o No economically or commercially important species use or exist on the installation.
- o Unique or sensitive environmental areas, although nearby, are isolated topographically from the sites and receptors will not be affected.
- o Drinking water supplies of the installation and the community of Wales are not hydraulically connected to any of the sites and are not threatened. (P.D.)

  
\_\_\_\_\_  
DAVID R. PAULSEN, Colonel, USAF  
Commander, 11 TCG

7 MAR 88  
Date

Tin City AFS

REVIEW AND CONCURRENCE:

Jorgez Guzman  
U. S. Environmental Protection Agency  
Region 10, Alaska Operations Office

27 Feb 1988  
Date

\_\_\_\_\_  
State of Alaska  
Department of Environmental Conservation

\_\_\_\_\_  
Date

Tin City AFS

REVIEW AND CONCURRENCE:

\_\_\_\_\_  
U. S. Environmental Protection Agency  
Region 10, Alaska Operations Office

\_\_\_\_\_  
Date

*Richard Coemack*

\_\_\_\_\_  
State of Alaska  
Department of Environmental Conservation

*9-26-88*  
\_\_\_\_\_  
Date

# TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1.0 SUMMARY	9
1.1 Introduction	9
1.2 Site Description and Setting	9
1.3 Site History	10
1.4 Current Site Status	10
1.4.1 Site Visit	10
1.4.2 Risk Screening	19
1.5 Alternatives	19
1.6 Consistency with Environmental Laws	19
1.7 Conclusion	19
2.0 TECHNICAL ATTACHMENTS	21
2.1 Site Description	21
2.1.1 Location	21
2.1.2 Environmental Setting	22
2.1.2.1 Geology	22
2.1.2.2 Hydrology	24
2.1.2.3 Biota	25
2.1.3 Site History	27
2.1.4 Site Operations	28
2.1.5 Chemicals Used	32
2.1.6 Previous Studies	32
2.2 Current Site Status	37
2.2.1 Findings from Previous IRP Studies	37
2.2.2 Observations from Site Visit	37
2.2.3 Findings from the Literature Search	40
2.2.4 Consistency with Environmental Laws	41
2.2.4.1 Resource Conservation and Recovery Act (RCRA)	41
2.2.4.2 Clean Water Act	41
2.2.4.3 Safe Drinking Water Act	42
2.2.4.4 Coastal Zone Management Act	42

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
2.3 Potential Contaminants	43
2.3.1 Dump No. 1 - Upper Camp (Site 1)	43
2.3.2 Dump No. 2 - Lower Camp (Site 3)	43
2.3.3 Waste Accumulation Area - Lower Camp (Site 4)	43
2.3.4 Spill/Leak No. 1 - White Alice Site (Site 5)	44
2.3.5 Spill/Leak No. 2 - Lower Camp (Site 6)	44
2.3.6 White Alice Site (Site 7)	45
2.3.7 Runway Oiling (Site 8)	45
2.3.8 Mid-Mountain Dump (Site 9)	45
2.4 Contaminant Movement	46
2.4.1 Spill/Leak No. 2 - (Site 6)	46
2.4.2 Runway Oiling (Site 8)	47
2.5 Qualitative Risk Screening	48
2.5.1 General Approach	48
2.5.2 Definition of Risk	48
2.5.3 Specific Approach	49
2.5.4 Logic Supporting the Assessment	52
2.5.4.1 Dump No. 1 - Upper Camp (Site 1)	55
2.5.4.2 Dump No. 2 - Lower Camp (Site 3)	55
2.5.4.3 Waste Accumulation Area - Lower Camp (Site 4)	55
2.5.4.4 Spill/Leak No. 2 - Lower Camp (Site 6)	55
2.5.4.5 Runway Oiling (Site 8)	56
2.5.4.6 Mid Mountain Dump (Site 9)	56

# TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
2.6 Alternatives Analysis	56
2.6.1 Purpose	56
2.6.2 Evaluation of Criteria and Method	57
2.6.3 Alternatives to be Evaluated	60
2.6.3.1 Dump No. 1 - Upper Camp (Site 1)	60
2.6.3.2 Dump No. 2 - Lower Camp (Site 3)	60
2.6.3.3 Waste Accumulation Area - Lower Camp (Site 4)	60
2.6.3.4 Spill/Leak No. 2 - Lower Camp (Site 6)	61
2.6.3.5 Runway Oiling (Site 8)	61
2.6.3.6 Mid Mountain Dump (Site 9)	61
2.6.4 Results	62
2.6.4.1 Upper Camp (Site 1)	63
2.6.4.2 Lower Camp (Site 3)	63
2.6.4.3 Waste Accumulation Area - Lower Camp (Site 4)	64
2.6.4.4 Spill/Leak No. 2 - Lower Camp (Site 6)	64
2.6.4.5 Runway Oiling (Site 8)	65
2.7 Summary	66
2.8 Bibliography and Contacts	66

## 1.0 SUMMARY

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### 1.1 INTRODUCTION

The Tin City Air Force Station, located in Alaska's Bering Sea Province, was investigated under Phase I of the Installation Restoration Program (IRP). The findings of that study indicated eight potentially contaminated areas at the installation (Eng. Sci. 1985). The report recommended follow-up action for all sites. A 1987 field visit verified that cleanup activities had occurred at several sites. No evidence of contamination was observed at the sites where cleanup has not occurred. The following document presents the information collected in support of no further action at Tin City AFS.

### 1.2 SITE DESCRIPTION AND SETTING

The Tin City AFS is located near the western tip of the Seward Peninsula, along Norton Sound. It is situated about 1030 km north of Anchorage, 900 km west-north-west of Fairbanks, and 160 km northeast of Nome (Figure 1). The Air Force Station consists of approximately 305 hectares adjacent to the Alaska Maritime National Wildlife Refuge (AMNWR). The nearest settlement is Wales, a Native Alaskan community about 8 km to the northwest. The topography in the vicinity of the AFS is relatively flat to the east, becoming steeper to the west. Four drainages are found within the boundaries of the installation. Cape Creek flows to the east of the runway and Lagoon Creek flows to the west. Paulina Creek and an unnamed drainage flow through the Lower Camp. All four creeks drain

## Tin City AFS

into Norton Sound (Figure 1). The terrain supports areas of wet and alpine tundra.

Tin City AFS is divided into an Upper and Lower Camp (Figure 2). They are connected by a tramway and a road. An airstrip is located on a separate land parcel west of the Lower Camp. Several gravel roads connect the buildings of the camp.

### 1.3 SITE HISTORY

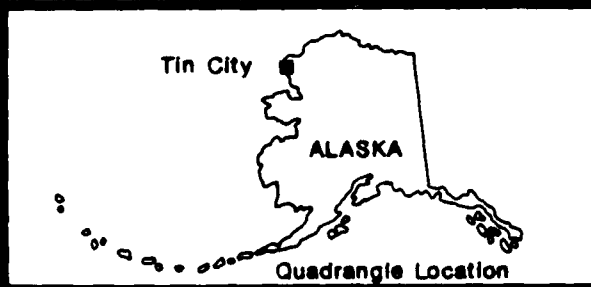
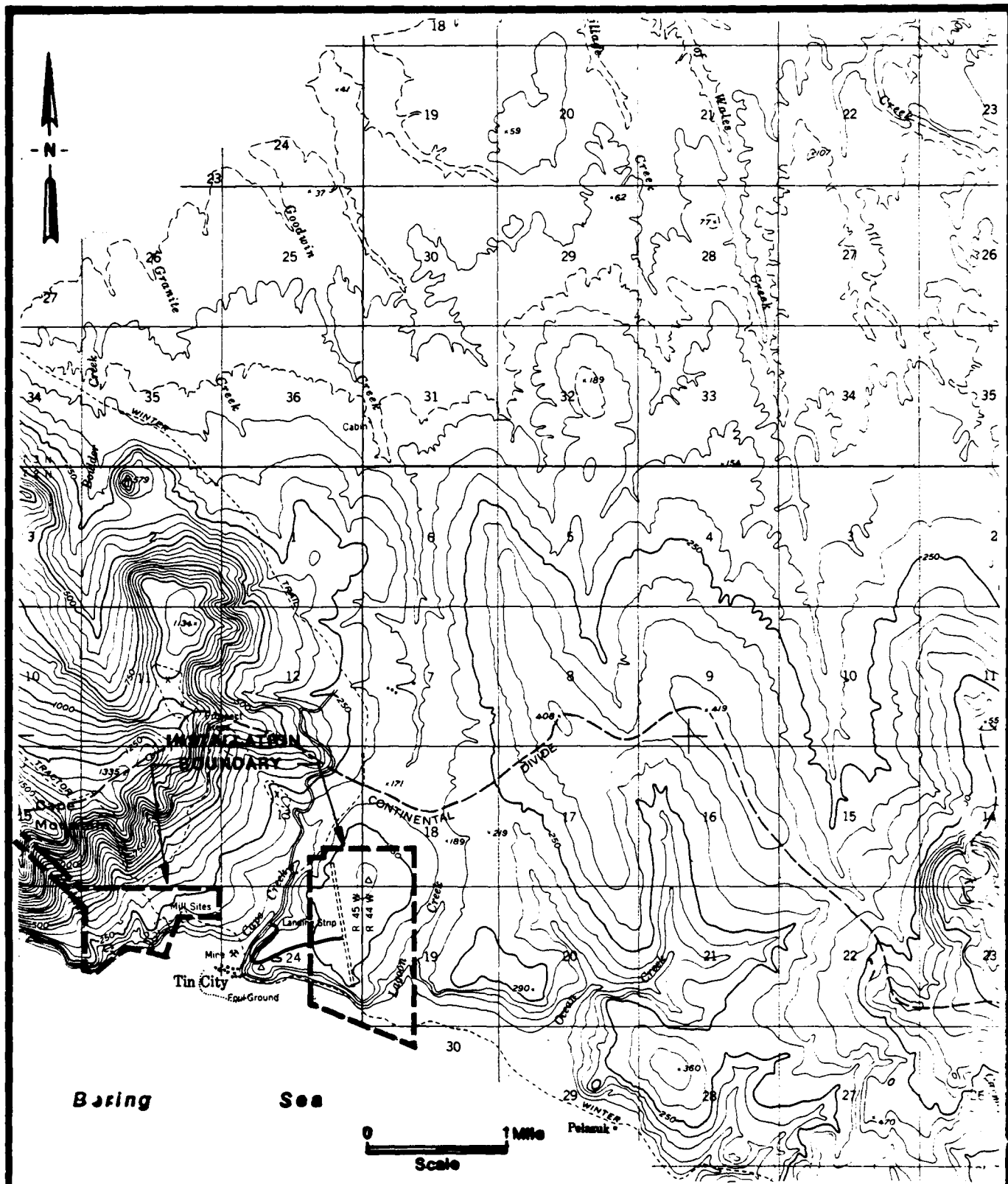
Tin City AFS was one of the ten original Aircraft Control and Warning sites constructed in Alaska as part of the Air Defense System; it became operational in 1953. In 1958 a White Alice station was added. In 1975, an Alascom satellite earth terminal system replaced the White Alice facility. The structures associated with the White Alice site remain. Ownership and responsibility for the site has been transferred to the Department of the Navy. In 1984 a minimally attended radar (MAR) unit was activated allowing significant staff reduction.

The Phase I report identified eight potential sites of contamination at Tin City (Table 1). Site 1 is an Upper Camp dump, Sites 2, 3, and 4 are a landfill, dump, and waste accumulation area at the Lower Camp. Sites 5 and 6 are spill/leak areas, Site 7 is the White Alice site and Site 8 is a past runway oiling area.

### 1.4 CURRENT SITE STATUS

#### 1.4.1 Site Visit

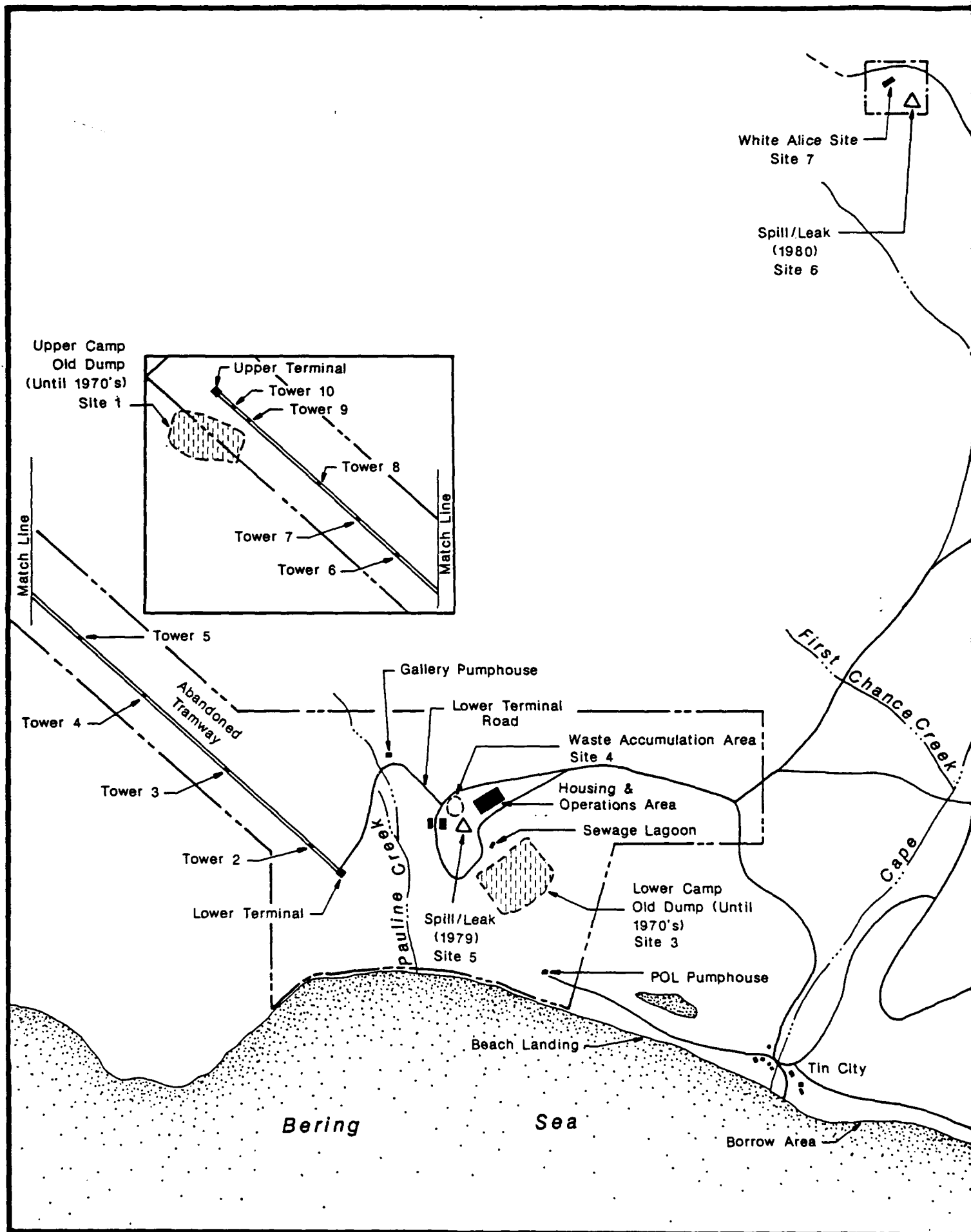
The Tin City AFS was visited by representatives from the U.S. Air Force and Woodward-Clyde Consultants. The visit took place on August 25, 1987, and was part of a trip to other LRRS

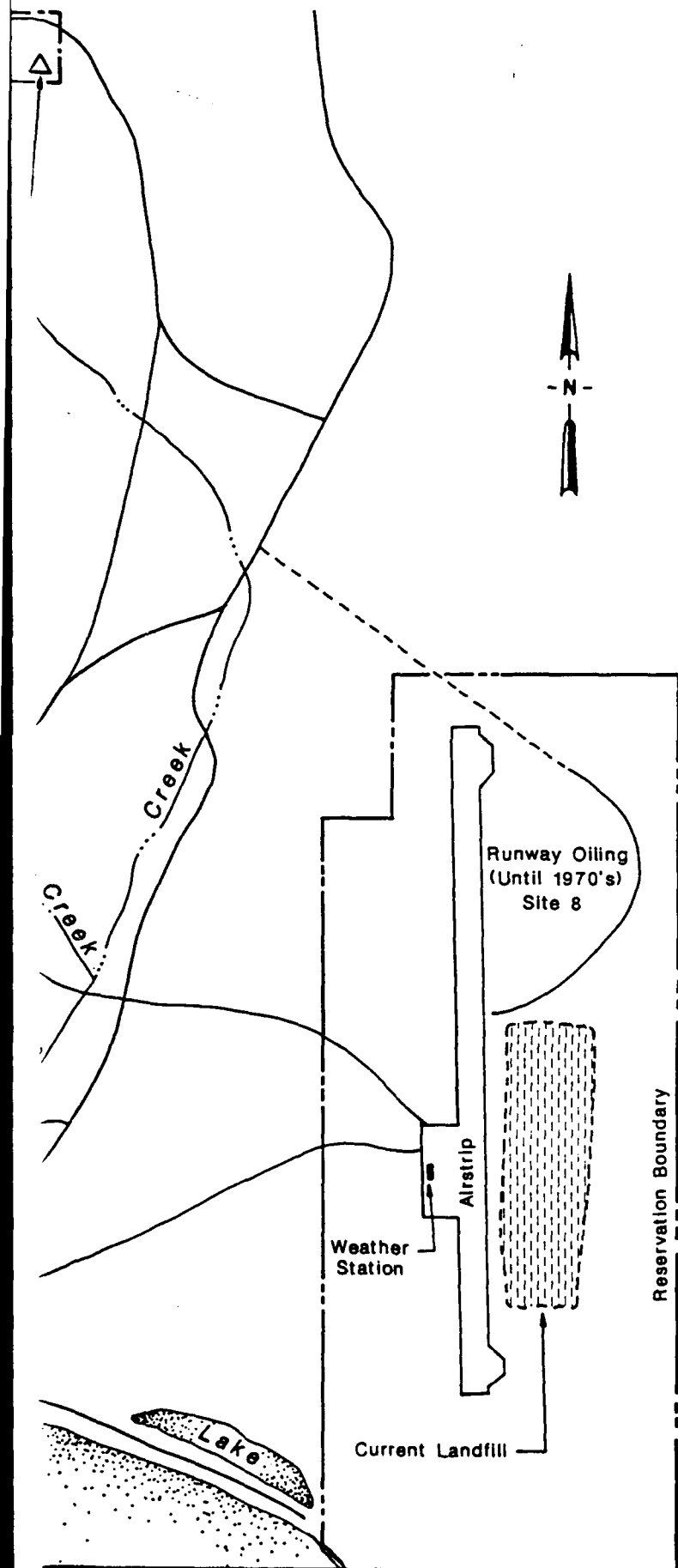


## TIN CITY AFS TOPOGRAPHIC MAP

**Woodward-Clyde Consultants**

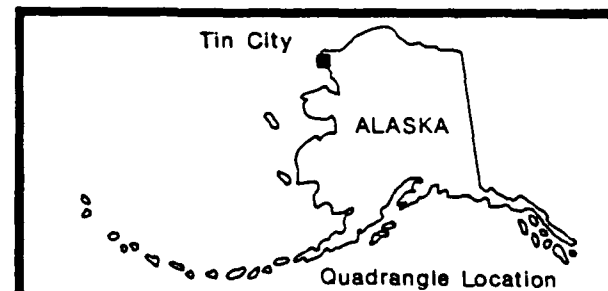
**Figure  
1**





Mid-Mountain Dump  
(Near Road To Upper  
Camp, Not Shown)  
Site 9

0 800 1600 Ft  
Scale



# TIN CITY AFS SITE PLAN

Woodward-Clyde Consultants 

Figure  
2

302

Table 1  
Findings from Phase I Study 1985

Site	Remedial History and Potential Contamination Problem	Phase I Findings	Recommended Action
Dump No. 1 - Upper Camp (site 1)	Used from 1950's to late 1970's. Partially cleaned in 1978 and 1984. Refuse, scrap metal, unused POL wastes disposed off top of mountain into adjacent valleys.	Site rated a HARM* Score of 68 due to presence of receptors and transport pathways.	Follow-on action to include sediment and surface water sampling at Paulina Creek.
Dump No. 2 - Lower Camp (site 3)	Used from 1950's to 1970's. Partially cleaned in 1978 and 1984. Refuse, scrap metal, and POL disposed of here.	Site rated a HARM* Score of 61 due to presence of receptors and waste characteristics.	Follow-on action to include geophysical study, test pits, soil and ground water sampling.
Waste Accumulation Area - Lower Camp (site 4)	Long-term storage of waste oils, unused oils and ethylene glycol. Evidence of small leaks and spills.	Site rated a HARM* Score of 60 due to presence of receptors and waste characteristics.	Follow-on action: sample soils beneath area to a 5-ft depth.
Spill/Leak No. 1 - White Alice Site (site 5)	Spill of 850 gal. of diesel fuel in 1980. No recovery.	Site rated a HARM* Score of 59 due to presence of receptors and waste characteristics.	Follow-on action included in sampling for site 1 work.

\* Hazard Assessment Rating Methodology  
Source: Engineering Science 1985.

Table 1 (continued)  
Findings from Phase I Study 1985

Site	Remedial History and Potential Contamination Problem	Phase I Findings	Recommended Action
Spill/Leak No. 2 Lower Camp (site 6)	Spill of 300 gal. of diesel fuel in 1979. No recovery.	Site rated a HARM * Score of 59 due to presence of receptors and waste character- istics.	Follow-on Action to include soil sampling in area of spill.
White Alice Site (site 7)	Suspected disposal of oil containing PCBs.	Site rated a HARM * Score of 51 due to presence of receptors.	Follow-on Action included in sampling for site 5.
Runway Oiling (site 8)	Liquid shop wastes applied to runway for dust control.	Site rated a HARM * Score of 56 due to presence of receptors.	Follow-on Action: sample soils to 5-ft depth along center of runway.

\* Hazard Assessment Rating Methodology  
Source: Engineering Science 1985.

## Tin City AFS

installations in Alaska. A written synopsis of the visit is on file with the Alaska Air Command, Elmendorf AFB, Alaska.

Sites visited at Tin City AFS (Table 2) include an abandoned dump and a spill/leak area at the Lower Camp (Sites 1 and 6), an active landfill (Figure 3), an abandoned dump, a waste accumulation area, and an area of runway oiling, all located at the Lower Camp (Sites 2, 3, 4, and 8, respectively). The White Alice Station and a nearby spill/leak area were investigated (Sites 5 and 7). An additional dump site (Site 9) located along the road about midway between the Upper and Lower Camps was also visited. However, this is not a site that was addressed in the Phase I report (Eng. Sci. 1985).

The Upper Camp dump area (Site 1) is situated on a steep slope subject to high winds and severe weather (Figure 4). No debris or signs of contamination were observed by the field team. It is likely that any debris noted during Phase I investigations has since been blown from the site. There was no evidence of contamination remaining at spill/leak No. 2 (Site 6) also located at the Lower Camp. The area is barren and rocky.

The White Alice site and reported spill/leak there, (Sites 7 and 5, respectively) was recently transferred to the Department of the Navy and is therefore beyond the scope of this project. The field survey team did not observe any signs of a spill or other contamination. The terrain in the area is naturally unvegetated and rocky.

Table 2  
Findings from 1987 Site Visit

Site	Site Description	Observations	Recommended Actions
Dump No. 1 - Upper Camp (site 1)	Refuse, scrap, used POL disposed off top of mountain into adjacent valleys. Partially cleaned and restored in 1978 and 1984.	No wastes observed; no signs of contamination. The reported dump site and surrounding areas are unvegetated.	No Further Action
Dump No. 2 - Lower Camp (site 3)	Located behind composite building. Mostly used for metal and construction debris.	Recently leveled and regraded. No wastes or debris observed. No leachate from area.	No Further Action.
Waste Accumulation Area - Lower Camp (site 4)	Long-term storage of waste and unused oils, and ethylene glycol. Possible site of small leaks and spills.	Drums and stored wastes removed. No evidence of spills leaks or stains.	No Further Action.
Spill/Leak No. 1 - White Alice (site 5)	Site of 850-gal. Diesel fuel spill in 1980. No fuel was recovered.	No evidence of spill was observed. Ground in the area barren and rocky.	Not applicable under scope of this report due to transfer of land to Department of the Navy.
Spill/Leak No. 2 - Lower Camp (site 6)	Site of 300-gal. diesel fuel spill in 1979. No fuel was recovered.	No evidence of contamination. Area is unvegetated and rocky.	No Further Action.
White Alice Site (site 7)	Suspected disposal of PCB oils.	Buildings and antennae remain. No contamination observed.	Not applicable. Ownership of site transferred to Department of the Navy.

Table 2 (continued)  
Findings from 1987 Site Visit

Site	Site Description	Observations	Recommended Actions
Runway Oiling (site 8)	Shop wastes applied to runway from 1950s to 1970s.	No evidence of contamination.	No Further Action.
Mid Mountain Dump (site 9)*	Used as debris dump during Upper Camp refitting. Area has been filled and graded.	No evidence of contamination. Surrounding areas are naturally unvegetated.	No Further Action.

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\* Not designated as a site in Phase I



Current Landfill  
Tin City AFB



Upper Camp Dump  
Tin City AFB

## Tin City AFS

### 1.4.2 Risk Screening

Environmental and health risks were assessed at the sites identified in the Phase I report. Although the Mid Mountain Dump (Site 9) was not discussed in the Phase I report, this site was also evaluated. Sites identified in the Phase I report which are no longer owned by the Air Force are not considered in this record (Sites 2, 5, 7). Risk was determined to be negligible at all remaining sites (1, 3, 4, 6, 8, and 9).

### 1.5 ALTERNATIVES

Alternative actions were considered for all six sites at Tin City AFS. Alternative actions evaluated were no further action, additional investigation, and additional investigation and excavation. The no action alternative is recommended for all sites at Tin City.

### 1.6 CONSISTENCY WITH ENVIRONMENTAL LAWS

The Tin City AFS was found to be in compliance with the following environmental laws:

- o Resource Conservation and Recovery Act (RCRA)
- o Clean Water Act
- o Safe Drinking Water Act
- o Coastal Zone Management Act

### 1.7 CONCLUSION

Based on a comprehensive literature search, observations made during a site visit in 1987, information gathered from government regulatory agencies, and the characteristics of suspected or known contaminants, the health and environmental

## Tin City AFS

risks at all six sites assessed at Tin City were judged to be negligible. An analysis of action alternatives determined that "no further action" was the preferred alternative for all six sites.

## 2.0 TECHNICAL ATTACHMENT

---

### 2.1 SITE DESCRIPTION

#### 2.1.1 Location

Tin City Air Force Station (AFS) is located near the western tip of the Seward Peninsula along Norton Sound at the southern foot of Cape Mountain (Figure 1). The AFS is situated 1030 km northwest of Anchorage, 900 km west-northwest of Fairbanks, 160 km northwest of Nome, and 8 km southeast of Wales. The installation consists of 305 hectares adjacent to the Alaska Maritime National Wildlife Refuge, Bering Sea Unit. Tin City AFS is located at latitude 65°34' North and 167°56' West, and is only accessible by sea or air, with the exception of a few local trails. The small, intermittent mining community of Tin City is located near the mouth of Cape Creek a few hundred meters from the AFS. The population mainly consists of tin miners and mining support personnel and varies from 1 to 100 persons. At present, Tin City is inhabited by 1 to 4 people (Langley 1988). The larger native community of Wales is located 8 km northwest. Wales has a year-round population of 150, 95 percent of which is Native Alaska (USGS, Community and Regional Affairs Report 1987).

## Tin City AFS

### 2.1.2 Environmental Setting

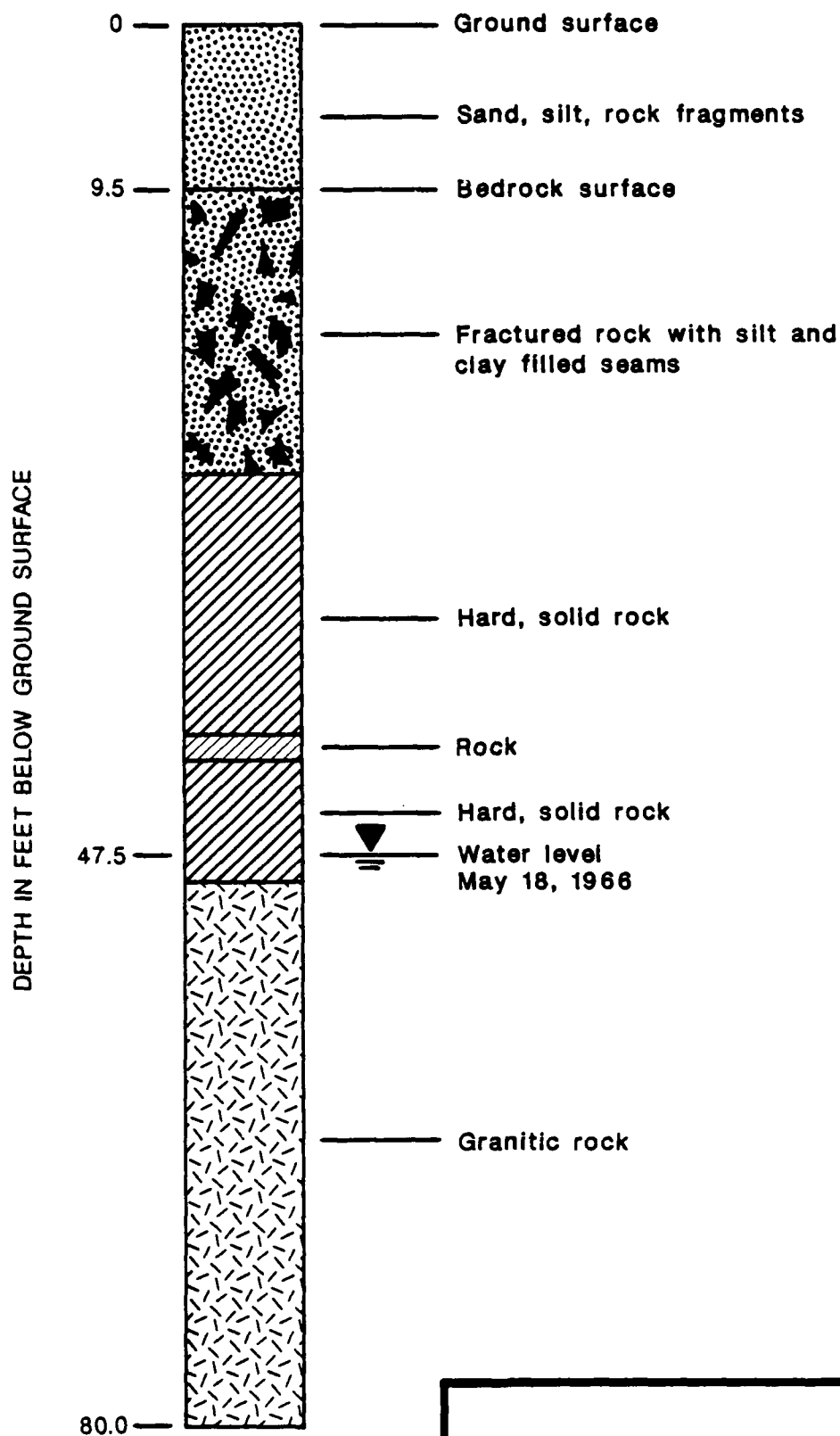
#### 2.1.2.1 Geology

The Tin City AFS is unique because the installation consists of two geographically separate parcels of land. One parcel contains the station's runway and current landfill, and the other contains the Lower and Upper Camps. The parcel containing the runway is located east of Cape Creek and is situated over limestone bedrock with surficial deposits. These surficial deposits are typically deeper than those found to the west at the Lower Camp area (Figure 2). The Lower Camp is located on Cape Mountain at Paulina Creek. The bedrock here consists of weathered, fractured granite. Surface Quaternary deposits overlying the bedrock are dominated by highly permeable, poorly sorted alluvium and talus of silt, sand, gravel, cobbles, and boulders. The deposits are relatively shallow. A well log shows them to be less than 3 m thick (Figure 5). The surface material at the Upper Camp consists of a thin veneer of residual soils and talus in between granitic bedrock outcrops (Eng. Sci. 1985).

The geology of the area is economically unique because the contact zone of the tin-rich, granitic bedrock and the limestone bedrock is situated between the two Air Force parcels. This contact zone between the two rock bodies is a source of lode and placer type tin deposits and has been economically important in the past (Sainsbury 1972).

The inactive White Alice Communications Site (WACS) is separate from the main portion of the installation (Figure 2). It is located over limestone bedrock covered with eroded residuum. The WACS is at an elevation of approximately 180 meters above mean sea level, and a shallow cover of eroded material would be expected.

El. 352 Feet (Approx.)



Source: Modified from U.S. Geological Survey  
Water Resources Division File Data,  
undated.

TIN CITY AFS  
WELL LOG

Woodward-Clyde Consultants



Figure  
5

## Tin City AFS

### 2.1.2.2 Hydrology

The topography at Tin City AFS east of Cape Creek is relatively flat with an approximate elevation of 75 meters above mean sea level (msl). Two creeks flow to either side of the plateau containing the runway. Cape Creek is to the west of the runway and Lagoon Creek is to the east. Both creeks drain directly into Norton Sound and probably receive surface runoff from the runway area.

The main portion of the AFS, located west of Cape Creek and containing the Lower and Upper Camps, has more topographical relief (Figure 1). The parcel is situated on the southeast shoulder of Cape Mountain with the Upper Camp area at an elevation of approximately 450 m above msl. The terrain drops steeply to a height of 75 m above msl at the Lower Camp. The two camps are connected by a tramway and a winding road. Paulina Creek and an unnamed creek 600 meters northwest of Paulina Creek are the two principal drainages for this portion of the AFS. Both creeks drain south into Norton Sound.

The inactive White Alice site appears to be located on or very near the continental divide at an elevation of about 180 meters (Figure 1). All runoff would be expected to flow north and south from this facility (USGS topo map).

Permafrost is most likely intermittent along the coast. Farther inland it is mostly continuous to a maximum depth of 180 meters and occurs primarily in fine-grained silt and clay soils (Ferrians 1965). The existence of permafrost at the AFS is undetermined but may underlie the installation in some areas. The area is not considered to be wetlands.

Ground water at the Upper Camp, if present, may occur in the secondary openings of the granitic bedrock or may be trapped

## Tin City AFS

seasonally in the residual materials as perched water (Eng. Sci. 1985). Ground water is found in the secondary openings of the granitic bedrock at the Lower Camp. These bedrock openings include faults, fractures, and fissures, and occur at highly variable depths below ground surface. It is recharged at the base by infiltration of precipitation and streamflow seepage through the highly permeable surficial residuum (Eng. Sci. 1985).

The installation water supply consists of one supply well and a gallery. The well has been installed into fractured zones of granitic bedrock. The gallery has been constructed to intercept ground water flowing along a fault zone. Water is pumped from the well and gallery into storage tanks to be used by the installation (Eng. Sci. 1985, C. Humphry 1988). The water supply for the installation is located either upgradient or away from the six potentially hazardous sites at Tin City. Additionally, since the continental divide separates the installation from the settlement of Wales, the Wales drinking water supply cannot be impacted by the Tin City sites.

### 2.1.2.3 Biota

The Tin City AFS is adjacent to the offshore Alaska Maritime National Wildlife Reserve (AMNWR) created in 1980. The boundary between the Chukchi Sea Unit and the Bering Sea Unit of AMNWR is located just above Tin City at Wales. The Bering Sea Unit extends from Norton Sound to the Pribilof Islands. Nearly all of AMNWR is very rich in seabird life. Some common sightings in the area of Wales include horned puffins (Fratercula corniculata) which inhabit the steep rock headlands. Common and thick billed murres (Uriaa spp.), black-legged kittiwakes (Rissa tridactyla), gulls (Larus spp.) and cormorants (Phalacrocorax spp.) are also commonly seen (Bailey 1948). Lopp Lagoon, a large, shallow, protected

## Tin City AFS

lagoon just north of Wales, is prime habitat for migrant water birds such as eiders (Somateria spp.), oldsquaws (Clangula hymalis), scoters (Melanitta), emperor geese (Phalacrocorax canagica), loons (Gavia spp.), and others (Bailey 1948). Common raptors include golden eagles (Aquila chrysaetos) and gyrfalcons (Falco rusticolus). The area supports a very large migrant bird population. Peregrine falcons (Falco peregrinus), an endangered species, has been known to occur in the Norton Sound area (U.S. Dept. of Interior 1988). Nesting habitat for peregrine falcons was not found during the 1987 site visit nor were reports of their existence at the installation found during the literature search for this study.

Common mammals on the Seward Peninsula include brown bears (Ursus arctos), which are found from mid-April to early November in conjunction with Arctic ground squirrels (Citellus parryii), a major food source for bears. Caribou and reindeer (Rangifer spp.), moose (Alces alces), red fox (Vulpes fulva), and two species of lemmings (Synaptomys borealis) and (Lemmus trimucronatus) are also commonly found on the Seward Peninsula (U.S. Dept. of Interior 1988).

The vegetation of the area is differentiated by two different terrain types on each parcel of Air Force land. The runway and weather station east of Cape Creek is in a vegetation type classified as wet tundra. The Upper and Lower Camps west of Cape Creek are in an area classified as sparse alpine tundra. Wet tundra vegetation with moderate to good drainage contains dwarf willows (Salix spp.), cottongrass (Eriophorum spp.), narrow-leaf Labrador-tea (Ledum decumbens), mountain cranberry (Vaccinium vitis-idaea) and other various herbs, mosses and lichens. All vegetation is less than 1 m high (Viereck 1972). Alpine tundra is much drier and typically characterized by low mat-type vegetation interspersed with barren rock. Dwarf

## Tin City AFS

willows (Salix spp.) may be present in low mats. Mountain avens (Dryas spp.), crowberry (Empetrum nigrum), sedges (Carex spp.), and lichens are plants that can occur sparsely on Cape Mountain (Viereck 1972). The Upper Camp is mainly unvegetated. The Lower Camp is sparsely vegetated. This is due to the rocky soil and extremely high winds the area receives (WCC site notes 1987).

Two plant species which might occur in the Tin City area are under investigation (Category 2) by the U.S. Department of Interior for endangered species eligibility (Murray 1987). One plant is a primula (Primula tschuktschorum spp. beringensis) which is restricted to the Chukchi and Seward peninsulas and St. Lawrence Island in the Bering Strait Region. The other plant is a small arctic sorrel (Rumex krausei) which has been found only twice in Alaska, near Cape Thompson and on the tip of the Seward Peninsula near Lost River (Murray 1987). It is not known if these plants occur at Tin City or within the boundaries of the AFS at Tin City.

### 2.1.3 Site History

Tin City AFS is one of the ten original Aircraft Control and Warning (AC&W) sites constructed in Alaska as part of the Air Defense System. The installation at Tin City became operational as a coastal surveillance site in 1953 and was maintained by a military staff of 95. In 1985, 250 hectares were officially set aside for military use by Public Land Order (PLO) 5187. In 1959, the same PLO granted military use of an additional 2.5 hectares to be used for the White Alice site. Right of Ways exist for roads leading to the different sections of the installation (Figure 6). The White Alice Communications Station (WACS) was built in 1958 replacing the high frequency radio system. The WACS was deactivated in 1975 and replaced with an Alascom-owned satellite earth terminal

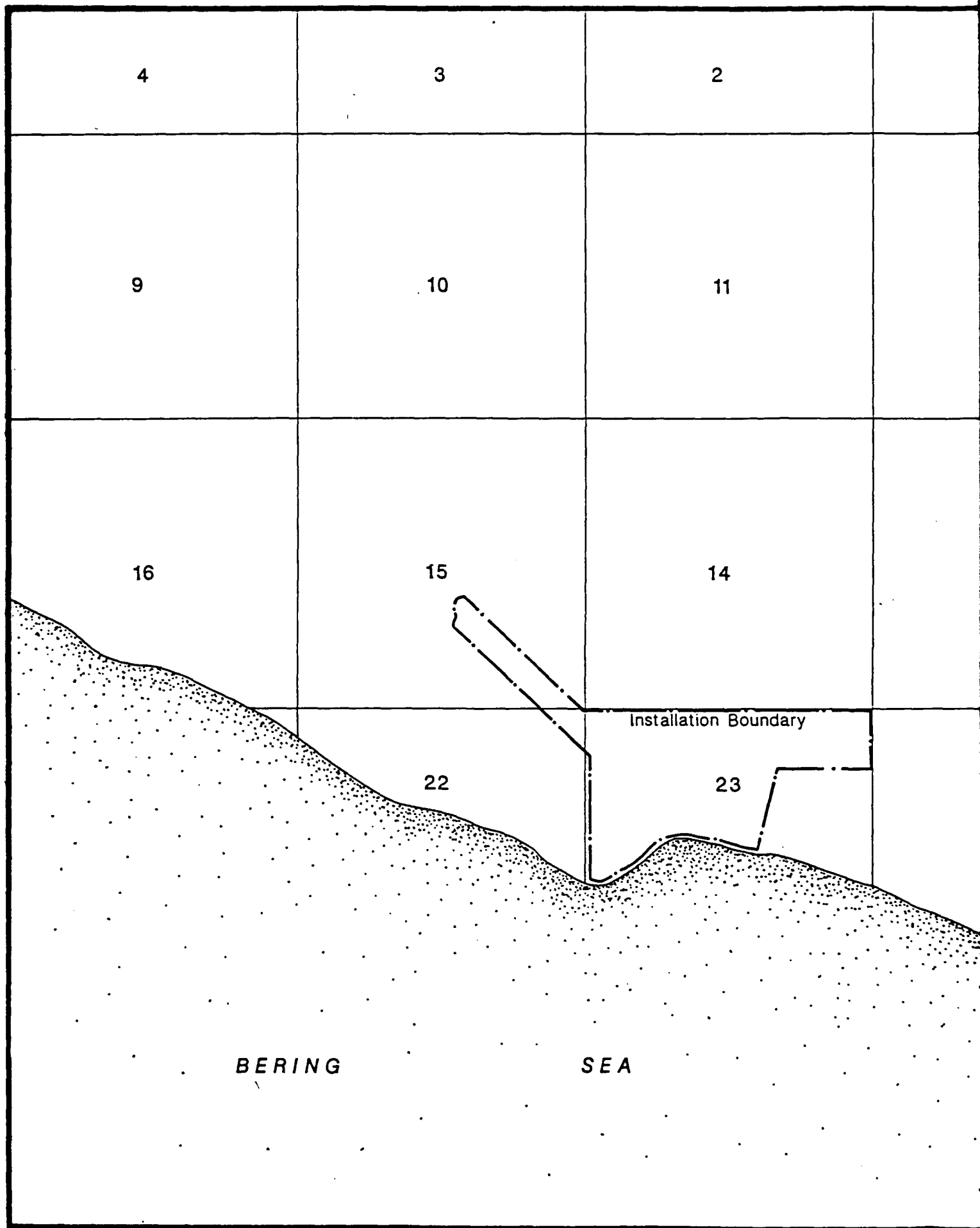
## Tin City AFS

system. In 1977, Alaska Air Command (ACC) implemented a site support contract with RCA Services which eliminated 81 military positions at Tin City AFS (Eng. Sci. 1985). A Joint Surveillance System (JSS) was installed in 1982. The system transmitted radar and beacon data by satellite directly to Elmendorf Regional Operation and Control Center (ROCC), eliminating all military positions and permitting operation of the installation by RCA personnel. The activation of Minimally Attended Radar (MAR) in 1984 allowed for the RCA staff to be reduced to 10 positions (Eng. Sci. 1985, C. Humphry 1988).

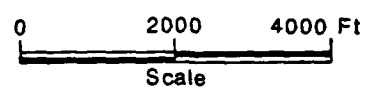
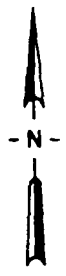
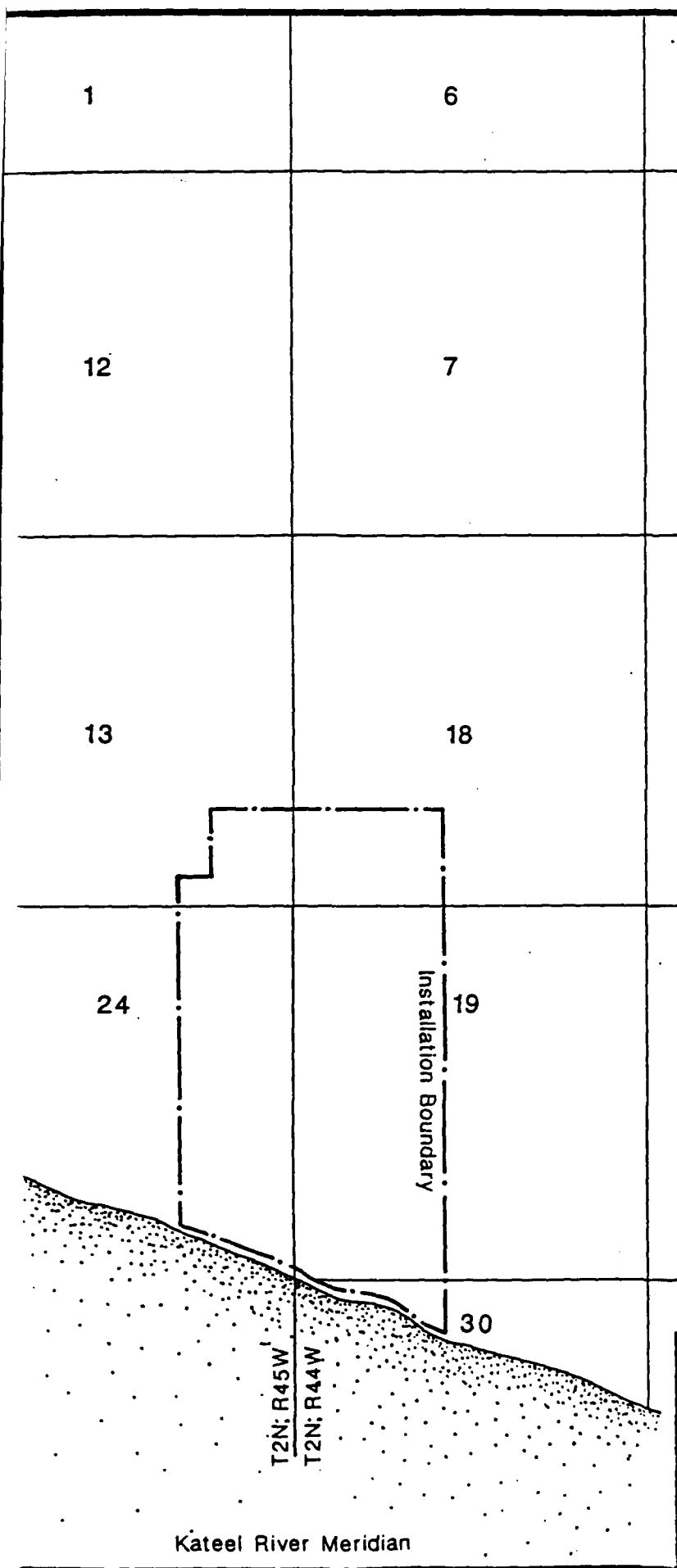
Most of the land surrounding the installation was conveyed in March of 1982 to the Bering Straits Native Corporation in conjunction with the Wales Native Corporation. Several hundred hectares, located 3 km northeast of the installation, are currently owned by the State of Alaska Department of Natural Resources (ADNR) Division of Research and Development. The installation boundaries do not come into contact with ADNR land. The 2.5 hectares at the White Alice site were turned over to the Navy Facility Engineering Command in 1985. There are several mining claims situated between the two individual installation boundaries along Cape Creek (Figure 6). Two mining claims are within or intersect the installation perimeter near the Lower Camp (Figure 6). Both of these parcels are small (1.6 hectares each) and near the installation boundary in section 23. The title to this land was granted to the Bartels Tin Mining Company in 1911.

### 2.1.4 Site Operations

The White Alice site was abandoned in 1975 and was turned over to the Department of the Navy in 1985. The section of Tin City AFS located to the east of Cape Creek includes the 1430-m runway and the weather station. The section located on the



1082



TIN CITY AFS  
LAND OWNERSHIP PLAT


Woodward-Clyde Consultants 

Figure  
6

292

## Tin City AFS

western side of Cape Creek includes the main body of the installation. Many of the buildings located at the facility have been abandoned and are slated for demolition in 1993. A composite building for housing and operations, a tram terminal, an incinerator, and 7 large capacity fuel tanks are presently in use at the Lower Camp (Table 3, C. Humphry 1988). The Upper Camp facilities include the living quarters, the radome, the tram terminal, and 1 fuel tank. The living quarters at the Upper Camp are slated for closure in the summer of 1988. Facilities which are no longer used at this time include the sewage lagoon, the recreation building, the power plant building, one water storage building, and several fuel storage tanks distributed around the site (Figure 2). The buildings and facilities which have been abandoned are scheduled for demolition in 1993 (C. Humphry 1988).

The water gallery and well are located above the Lower Camp, near Paulina Creek. The gallery, a buried perforated pipe which acts as a "collecting pan", intercepts water moving along a fault zone and channels the water into the well. The water is pumped from the well and stored in tanks for use by the AFS. The water is chlorinated before dispensing (Feulner 1966).

A new power plant is located within the composite building. This power plant burns diesel to provide electricity for the installation. A septic system is currently used for treating sewage. Until 1985, sewage was treated in the sewage lagoon by an extended aeration process. The resulting sludge was deposited in the solid waste landfill. The station switched to a septic system because the sewage lagoon proved impractical for only 10 people (C. Humphry 1988).

TABLE 3

TIN CITY AFS  
LIQUID FUEL TANKS CURRENTLY USED

Facility	ground level	tank size (gal)	tank contents	location	status	comments
Weather Station Tank	Below	5000	Diesel	Weather Station	Active	
Tank 14	Above	500	Diesel	at Beach site	Active	Recently replaced 235 gal tank
Incinerator	Above	500	Diesel	Incinerator	Active	
Tank 12	Above	5000	Diesel	Upper Tram Terminal	Active	
Tank 5	Below	6000	Diesel	Lower Camp	Active	
Tanks 1 & 2	Above	492, 240 ea	Diesel	Lower Camp	Active	
Tank 10	Above	25,000	Diesel	Lower Camp	Active	
Tank 13	Above	2000	Diesel	Lower Tram Terminal	Active	

## Tin City AFS

### 2.1.5 Chemicals Used

Standard operating procedures at Tin City AFS have the potential to generate hazardous materials. Table 4 supplies a list of hazardous materials on inventory at the installation in 1985. The list was compiled by the operator, RCA. Activities using the items in Table 3 include: building construction and maintenance, power plant operation and maintenance, vehicle and aircraft maintenance, water purification, use of solvents for cleaning, heat exchange processes, fuel storage and dispensing, and other related uses.

### 2.1.6 Previous Studies

The Installation Restoration Program (IRP) was set up as a four phase program:

Phase I	Problem Identification/Records Search
Phase II	Problem Confirmation and Quantification
Phase III	Technology Base Development
Phase IV	Corrective Action Development

Phase I was completed by Engineering Science in 1985 for the Long Range Radar Stations (LRRS). The report divided the LRRS into a northern and a southern region. Tin City AFS is one of eight northern region sites considered. The Phase I investigations were prepared for the Air Force Engineering and Service Center in 1985.

TABLE 4  
LIST OF HAZARDOUS MATERIALS ON SITE JUNE 1985  
TIN CITY AFS

<u>MATERIAL NAME</u>	<u>TYPE OF CONTAINER</u>
EO-30	55 gal. drum
Antifreeze glycol used	55 gal. drum
90W oil unused	55 gal. drum
PE 10-1 oil unused	55 gal. drum
80W oil unused	55 gal. drum
OE-10 oil unused	55 gal. drum
Alcohol unused	55 gal. drum
Ethylene glycol unused	55 gal. drum (plastic)
OE/HDO-10 unused	55 gal. drum
OE-30 unused	55 gal. drum
OE/HDO-30	55 gal. drum
Quonset Hut	
Oxygen unused	225 cf. cyl.
Trichloroethane	1 gal. can
Sulfuric acid unused	1 gal. container
Nitrogen unused	225 cf. cyl.
Carbon dioxide unused	225 cf. cyl.
Hydraulic fluid unused	1 gal. can
Hydraulic fluid unused	1 qt. can
Asphalt cutback unused	1 gal. can
Adhesive floor unused	1 gal. can
Grease unused	5 gal. can
Insulating oil unused	5 gal. can
Brake fluid unused	1 gal. can
Grease unused	5 lb. can
Acetylene unused	225 cf. cyl.
Acetylene unused	10 cf. cyl.
Propane unused	150 cf. cyl.
Transmission fluid unused	5 gal. can
Freon 12 unused	30 lb. cyl.

TABLE 4  
LIST OF HAZARDOUS MATERIALS ON SITE JUNE 1985  
TIN CITY AFS  
(continued)

<u>MATERIAL NAME</u>	<u>TYPE OF CONTAINER</u>
Freon 12 unused	50 lb. cyl.
Freon 22 unused	cyl. cf. unknown
Argon unused	cyl. cf. unknown
Sodium hydroxide unused	100 lb. drum
Sodium hydroxide unused	50 lb. box
Phosphoric acid unused	5 gal. can
Helium unused	225 cf. cyl.
Extinguisher halon unused	20 lb. cyl.
Starting fluid unused	8 oz. can
Paint unused	1 gal. can
Paint unused	5 gal. can
Paint unused	pint spray can
Paint unused	1 quart can
Grease unused	4 oz. cart
Thinner paint unused	1 pt. can
Thinner paint unused	1 gal. can
Linseed oil unused	1 gal. can
Linseed oil unused	5 gal. can
Trichloroethane unused	1 gal. can
Paint remover unused	1 gal. can
Compound cleaning liquid unused	1 gal. can
Defrosting fluid unused	1 pint spray can
Bromochloromethane unused	5 gal. can
Adhesive floor unused	1 gal. can
Adhesive paper unused	1 gal. can
Adhesive bond unused	8 oz. tube
Methyl isobutyl ketone tech unused	1 gal. can
Turpentine unused	1 gal. can
Silicon lube unused	1 pint spray can

TABLE 4  
LIST OF HAZARDOUS MATERIALS ON SITE JUNE 1985  
TIN CITY AFS  
(continued)

<u>MATERIAL NAME</u>	<u>TYPE OF CONTAINER</u>
Adhesive spray unused	1 pint spray can
Starting fluid diesel unused	24 oz. cartridge
Sodium silicate unused	1 gal. can
Silicone RTV unused	8 oz. tube
Bowling lane cond. unused	1 gal. can
Bowling lane cond. unused	5 gal. can
Thinner lacquer unused	1 qt. can
Adhesive rubber unused	5 gal. can
Adhesive rubber unused	1 qt. can
Hydraulic fluid unused	5 gal. can
Polyester resin unused	1 gal. can
Polyester resin unused	6 gal. can
Plastic wood filler unused	1 lb. can
Leather finish	1 gal. can
CO2 cartridge unused	13 oz. cartridge
Liquid wrench penetra oil unused	1 pt. can
Insecticide aerosol unused	1 pint spray can
Compressor oil unused	1 qt. can
Sanuril 115 unused	5 gal. can
Sodium hydroxide unused	13 oz. can
Asphalt plastic patch D unused	5 gal. can
Bromochloromethane	5 gal. can
Oil PE-10	55 gal.
Oil CO 90	55 gal.
Oil CO 80	55 gal.
Oil 10-30W	55 gal.
Oil HDO-10	55 gal.
Oil turbine	55 gal.
Oil OE-10	55 gal.

TABLE 4  
LIST OF HAZARDOUS MATERIALS ON SITE JUNE 1985  
TIN CITY AFS  
(continued)

<u>MATERIAL NAME</u>	<u>TYPE OF CONTAINER</u>
Oil HD-30	55 gal.
Oil HD-30	55 gal.
Antifreeze	55 gal.
Antifreeze	55 gal.
Antifreeze	55 gal.
Cyclorex	1 drum
Alcohol	55 gal.

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None of these materials were found at the White Alice Site.

Note: These substances are not expected to be found at any Tin City disposal site. Hazardous waste materials and substances for retrogradation are transported to Elmendorf AFB. Used oils are containerized to await shipment off site.

Source: RCA/OMS Tin City

## Tin City AFS

### 2.2 CURRENT SITE STATUS

#### 2.2.1 Findings from Previous IRP Studies

Phase I (Eng. Sci. 1985) considered eight potential contamination areas at Tin City AFS (see Table 1 for site descriptions). Sites 1, 3, and 9 are old dump sites. Site 4 is the waste accumulation area. Sites 5 and 6 are fuel spill sites. Site 7 is the White Alice site, and Site 8 is a runway oiling area. Site 2 is the current landfill. Engineering Science rated Sites 1 through 8 as "Follow-up Action Warranted" during the 1985 Phase I investigations. The Phase I assessment was based on field inspections, file data, interviews, environmental setting and HARM rating scale (see Table 1). Site 9 was not considered in the Phase I report.

#### 2.2.2 Observations from Site Visit

The Tin City AFS was visited in August 1987 by representatives of the U.S. Air Force and Woodward-Clyde Consultants. The purpose of the visit was to observe current conditions at the eight potential contamination sites and to evaluate the conclusions of the Phase I report. Many of the potential contamination areas/sites identified in the Phase I report have been cleared and restored with clean cover.

Because of the recent clean-up and retrograding, Woodward-Clyde personnel were able to visually locate four of the eight sites described in Phase I. An additional site not delineated in the Phase I report (Site 9) was inspected during the Woodward-Clyde visit.

Site 1 is Dump No. 1 at the Upper Camp. This area was used for waste and construction debris until the late 1970's. Wastes from this area were collected during site clean-ups

## Tin City AFS

conducted in 1978 and 1984. Woodward-Clyde and Air Force personnel did not observe any contamination or debris. It was concluded that due to extremely high winds in the area (reaching or exceeding 135 knots several times a year) any remaining surface debris (paper, cans, etc.) has been blown away.

Site 3 is Dump No. 2 between the Lower Camp and the tin mines located along Cape Creek. Waste deposition at this site was discontinued in the late 1970's, and the area was restored in 1978 and 1984. At the time of the site visit, the area had been recently leveled and regraded. The site was reported to have been used primarily for the landfilling of concrete and metal debris. All wastes were covered, and no other wastes were observed. No free fluids or moisture were observed emanating from the landfill, and no other contamination was noted.

Site 4 is the Waste Accumulation Area which was used until 1985 to store drums of oil and ethylene glycol (Eng. Sci. 1985). At the time of the Engineering Science report in 1985, there was some evidence of small spills and leaks in the area. At the time of the Woodward-Clyde visit in 1987, no contamination was evident. The area had been recently filled and graded, and site visit personnel were unable to locate the specific site.

Site 5 is Spill Leak No. 1 at the White Alice site. Reportedly, 850 gallons of diesel was spilled when a valve failed in 1980. Woodward-Clyde and Air Force personnel did not find evidence of contamination. The area was dry and free from staining or odor. The Department of the Navy has been the tenant at this site since 1980, and the 2.5 hectare site was officially transferred to the Navy from the Air Force in 1985 (BLM land ownership records 1987).

## Tin City AFS

Site 6 is Spill/Leak No. 2. Reportedly, this spill consisted of 300 gallons of diesel that leaked from a broken pipeline near the incinerator tank. The spill occurred in 1979. The survey team was unable to locate the specific fuel spill area. No evidence of contamination was observed in the area by the survey team.

Site 7 is the White Alice Communication Station (WACS). During the visit to WACS, the team did not observe signs of contamination at the facility. The ground was unvegetated and free from staining. Again, it should be noted that the Department of the Navy has been the tenant at this site since 1980. The 2.5 hectare site was officially transferred to the Navy from the Air Force in 1985 (BLM land ownership records 1987).

Site 8 is the Runway Oiling that occurred from the 1950's to the 1970's. It is probable that waste oils and hydraulic fluid were used for this purpose. The Air Force and Woodward-Clyde team did not observe any signs of contamination resulting from the runway oiling. Runway oiling was discontinued in the 1970's. No staining or vegetative stress was observed.

Site 9 is referred to as the Mid-Mountain Dump, and it is not discussed in the Phase I report. The site had been used as a debris dump during the construction and refitting of the Upper Camp, and is located near the road on the way to the Upper Camp. At the time that Woodward-Clyde personnel visited the site, the area had been filled and graded. No wastes or debris were visible at the surface or near the margins of the area. No evidence of contamination was seen, and the area around the site was unvegetated.

## Tin City AFS

Site 2 is the current landfill directly east of the runway. This site is currently permitted by ADEC and will not be considered in the scope of this report.

### 2.2.3 Findings from the Literature Search

Permafrost in the region is mostly continuous to a maximum depth of 180 meters and is restricted to fine grain sediment sand (Ferrians 1965). Because of the moderation of ground temperatures by the ocean, it is unlikely that permafrost exists within 100 to 200 meters of the shore. It has not been determined whether continuous permafrost exists at the AFS. It has been determined that bedrock is fairly shallow at the Lower Camp (<3 meters).

The topography at the Lower Camp is moderately sloped, with all drainages flowing south into Norton Sound. The vicinity of the current landfill near the runway is moderately flat, with drainage from the landfill flowing south. The current landfill is located 700 meters from Norton Sound on the southeastward draining side of the runway, away from the intermittent mining community of Tin City southwest of the current landfill (Langley 1988).

Tin City is a very small mining community located near the mouth of Cape Creek approximately 600 m downslope of Lower Camp. Although Tin City's water supply is downgradient from Lisburne AFS, only the current landfill has the remote potential for releasing contamination.

This landfill is not located upgradient in the drainage path to Tin City. Rather, drainage from the landfill area flows south and south-eastward, away from Tin City. At present, there are only a few persons at Tin City because of the market price of tin (Langley 1988).

## Tin City AFS

The water supply of the Tin City AFS is located more than a kilometer upslope of the current landfill. It is also located upslope of the Lower Camp so that any areas of past potential contamination or future spills at the Lower Camp will not threaten the AFS drinking water supply.

Climatic conditions are cold, damp and foggy. The mean annual precipitation at Tin City is 30.5 cm. It is very windy, with winds dominantly from the north at 10 to 60 knots (Alaska Weather Service). Wind gusts have been recorded as high as 135 knots in the area.

### 2.2.4 Consistency With Environmental Laws

#### 2.2.4.1 Resource Conservation and Recovery Act (RCRA)

Subtitle C - Hazardous Waste Management. Defines hazardous wastes and prohibits disposal except in permitted facilities. Tin City AFS is in compliance with Subtitle C.

Subtitle D - State or Regional Solid Waste Plans. State or regional permits are required for non-hazardous waste disposal facilities. The current landfill is permitted by the Alaska Department of Environmental Conservation until October 1, 1988 at which time it must be renewed. The disposal of hazardous substances in the landfill is prohibited by the permit.

#### 2.2.4.2 Clean Water Act

Section 303 - Water Quality Standards and Implementation Plans. This requires water quality standards for all surface waters to be implemented by the

## Tin City AFS

states. In Alaska these have been promulgated by ADEC. There is no evidence that state water quality standards are being violated at Tin City AFS.

Section 311 - Oil and Hazardous Substance Liability. Accidental or intentional discharges of oil and hazardous substances are regulated.

Section 404 - Permits for Dredged or Fill Material. Modifications to the wetlands require a Discharge of Dredged or Fill Material Permit from the Army Corps of Engineers. Tin City is not considered a wetland, and therefore no 404 permits are required.

### 2.2.4.3 Safe Drinking Water Act

Section 1412 - National Drinking Water Regulations. Drinking water standards as promulgated by the Safe Drinking Water Act (SDWA) will not be exceeded by contamination.

Section 1413 - State Primacy Enforcement Responsibility. The State of Alaska has assumed primacy for enforcement of the SDWA. The water supply at Tin City is classified as class C (serving 25 persons or less). A permit is not required, nor is monitoring required. However, the installation routinely monitors for State primacy contaminants and submits results to ADEC. The water supply is Public Water Supply No. 320141.

### 2.2.4.4 Coastal Zone Management Act

Consistency with the Alaska Coastal Management Program must be demonstrated for all construction initiated after October 1983. A certificate of consistency was issued to Tin City AFS

## Tin City AFS

in July 1984 for demolition of the White Alice site. The demolition did not occur and the WACS was turned over to the Department of the Navy in 1985 (BLM land records 1987, Chris Humphry 1988).

### 2.3 POTENTIAL CONTAMINANTS

#### 2.3.1 Dump No. 1 - Upper Camp (Site 1)

This dump was made inactive in the late 1970's and clean-ups were conducted in 1978 and 1984. Refuse, scrap and used POL were dumped here, although there was no sign of waste or contamination in the area during the 1987 site visit.

#### 2.3.2 Dump No. 2 - Lower Camp (Site 3)

Waste deposition was discontinued at this site in the late 1970's and clean-up occurred in 1978 and 1984. Although the area was used for landfilling of concrete and metal debris, it has been covered, leveled, and graded. No wastes, fluids, or other contaminants were observed at the site during the 1987 site visit.

#### 2.3.3 Waste Accumulation Area - Lower Camp Area (Site 4)

This site was used to store drums of oil and ethylene glycol until 1985. Although there was evidence of small spills and leaks in the area in 1985, Woodward-Clyde personnel found no evidence of contamination during the 1987 site visit. The drums and stored wastes have been removed, and the area has been recently filled and graded.

## Tin City AFS

### 2.3.4 Spill/Leak No. 1 - White Alice Site (Site 5)

This site consisted of 850 gallons of diesel fuel spilled in 1980. Although none of the spilled fuel was recovered, there was no evidence of contamination during the 1987 site visit. Since this area has been transferred to the Department of the Navy, a discussion of potential contaminants and their movement and a risk assessment screening are outside the scope of this report.

### 2.3.5 Spill/Leak No. 2 - Lower Camp (Site 6)

This was the site of a 300 gallon diesel fuel spill in 1979. Although none of the spilled fuel was recovered, there was no evidence of contamination during the 1987 site visit. This site was assigned a HARM rating of 59, although no further action was considered warranted from the Phase II site visit.

Diesel fuel has a toxicity rating of 3, corresponding to a moderately toxic level. This rating is based on a toxicity scale of 1-6; a rating of 1 being practically non-toxic, and 6 being super toxic (Gosselin, 1984). The components of diesel are virtually insoluble in water. Diesel is derived from the middle distillates of crude petroleum, being composed of hydrocarbons in the C<sub>12</sub> to C<sub>25</sub> range, with a predominance of 15 to 17 carbon atoms. Diesel fuels typically contain about 30 percent paraffins, 45 percent naphthenes, and 25 percent aromatics. Specific gravities of pure product are between 0.80 and 0.85. Its volatility is lower than that of lighter fuels such as gasoline. Consequently, while many of the lower molecular weight hydrocarbons have probably volatilized in the last 9 years, other components may have remained in the soil.

## Tin City AFS

### 2.3.6 White Alice Site (Site 7)

This site is the White Alice Communication Station. It has been suspected that PCB-containing oils may have been disposed at this site. The area has been assigned a HARM rating of 51. However, the site has been transferred to the Department of the Navy and any discussion of potential contaminants, their movement, or risk screening, is outside the scope of this report.

### 2.3.7 Runway Oiling (Site 8)

Runway oiling at the Tin City site occurred from the 1950's to the 1970's. Waste oils and hydraulic fluids were applied to the runway as a dust palliative.

Until recently, the practice of road oiling to control dust was an accepted practice throughout the United States. Oils used in this manner do not release hazardous materials into the environment because neither waste oils nor hydraulic fluid contain more than trace amounts of hazardous materials. Surface disposal of oil brings the oil into contact with organisms which readily biodegrade most petroleum hydrocarbons, leaving small amounts of weathered insoluble and immobile materials.

There was no evidence of contamination found on or along the runway during the 1987 visit. The vegetation along the runway appeared to be healthy and stress-free. No dark staining was apparent on or along the runway.

### 2.3.8 Mid Mountain Dump (Site 9)

This site was not discussed in the Phase I report, but had been previously used as a debris dump near the Upper Camp.

## Tin City AFS

The area has been filled and graded, and no waste or debris was visible at or near the dump site. The site survey team found no evidence of contamination during the site visit.

### 2.4 CONTAMINANT MOVEMENT

Of the nine sites listed in Table 2 as potentially hazardous to receptors at Tin City, only sites 6 and 8 (diesel fuel spill and runway oiling, respectively) are addressed in this section. Follow-on action is considered unwarranted at sites 1, 3, 4 and 9 due to lack of any historical or confirmatory evidence of contamination. Sites 5 and 7 (the White Alice site) have been transferred to the Department of the Navy and are outside the scope of this report.

#### 2.4.1 Spill/Leak No. 2 (Site 6)

This is the site of a 300 gallon diesel fuel spill in 1979. Visual examination during the 1987 site visit revealed no evidence of contamination. Since none of the spilled fuel was recovered, a discussion of contaminant movement is included here.

Diesel fuel is relatively insoluble in water. Furthermore, adsorption of diesel fuel constituents on organic rich soils is a significant absorption and migration attenuation process. Thus, once fuel is spilled, migration is minimal except where hydraulic gradients are very steep. At Tin City, drainage from the Lower Camp is toward the Bering Sea and downgradient of the drinking water supply. Once infiltration has taken place, lateral migration is negligible because of the hydrophobic characteristics of petroleum compounds typical in diesel, and the adsorptive capacity of humic soils.

## Tin City AFS

Because of the low volatility of diesel fuel, particularly after many years of weathering, air transport of hazardous substances from a spill is insignificant. Biodegradation and chemical transformations, as well as physical processes such as volatilization and differential adsorption on soils, will occur in fuel spills. The surface drainage direction from site 6 is away from the installation's drinking water supply and the Bering Sea. The possible exposure to environmental receptors is negligible, and human exposure to hazardous levels is possible only through direct ingestion of contaminated soils.

### 2.4.2 Runway Oiling (Site 8)

Runway oiling was concluded in the 1970's. It is possible that waste oils from the road oiling actions migrated or were directly sprayed into the drainage. Since the 1970's, any contaminants that did migrate into the streams and drainages have since been transported off site or have been sufficiently degraded. Contaminants may have migrated in airborne dust particles from the roads. However, since the surface disposal of oil brings the oil into contact with organisms which readily biodegrade most petroleum hydrocarbons, only the traces of insoluble and immobile polynuclear aromatic hydrocarbons (PAH) remain. PAH's are readily adsorbed onto humic, carbon-rich soils. These hazardous materials are slowly degraded by photolytic, oxidative and biological processes. In some circumstances, lower molecular species such as naphthalene will sublime (a form of evaporation) and be removed from the surface environment. The 1987 site visit found no evidence of residual contamination. Because the potential tendency for traces of diesel residues to migrate is inconsequential, no additional action is recommended at site 8.

## 2.5 QUALITATIVE RISK SCREENING

### 2.5.1 General Approach

This is a qualitative risk screening of contamination at Tin City. The screening is qualitative because it relies on field observations and indirect data evaluations rather than direct and quantitated field or laboratory measurements. Many quantitative methodologies for risk screening are available ranging from statistical probability evaluations to numerical rating systems. However, an initial qualitative screening is necessary to justify the expense and effort needed to satisfy the data requirements of quantitative approaches. The purpose of this section is to provide that initial screening.

### 2.5.2 Definition of Risk

Risk is "the probability that a consequence of defined magnitude will occur." The three key concepts of this definition are probability, consequence and defined magnitude. Each is discussed below:

- o Probability - According to the above definition of risk, the mere presence of a hazardous substance at a site does not constitute significant risk; risk is the probability of adverse effects to humans or other receptors exposed to the hazardous substance. When that probability is negligible, risk will be considered to be negligible. Conversely, when that probability is not negligible, identifiable risks will be assumed to be present. Thus, probability is evaluated qualitatively rather than quantitatively in this document.
- o Consequence - A consequence is an adverse effect on a receptor(s) caused by exposure to oil or hazardous

substances. Receptors can be human or environmental resources. Environmental receptors include surface water, ground water, air, soils, vegetation or wildlife. For a receptor to be adversely affected by a contaminant, three general conditions must be met. First, contamination must be present in the environment. Second, the receptor must be exposed to that contaminant. Exposure is a function of contaminant release mechanisms, paths of migration, and chemical fate processes. Third, adverse effects are possible only if receptors are exposed to sufficient quantities of a contaminant and for sufficient intervals of time. This third condition introduces the concept of effect threshold, or the level of exposure necessary to cause an effect. For thresholds to be exceeded, toxicity of contaminants must be sufficiently high, their quantities or concentrations sufficiently large, and the durations/frequencies of contact with receptors sufficiently long to cause adverse impacts. The assessment procedure used here estimates the qualitative probability of these three conditions being present at a site.

- o Defined Magnitude - What constitutes an adverse effect must be established. That is, the magnitude of effect necessary to qualify as adverse or as a consequence must be defined. In general, for an effect to be considered adverse, it must be of sufficient magnitude to create health hazards, cause exceedences of environmental and health standards or regulations, or lead to significant environmental perturbations.

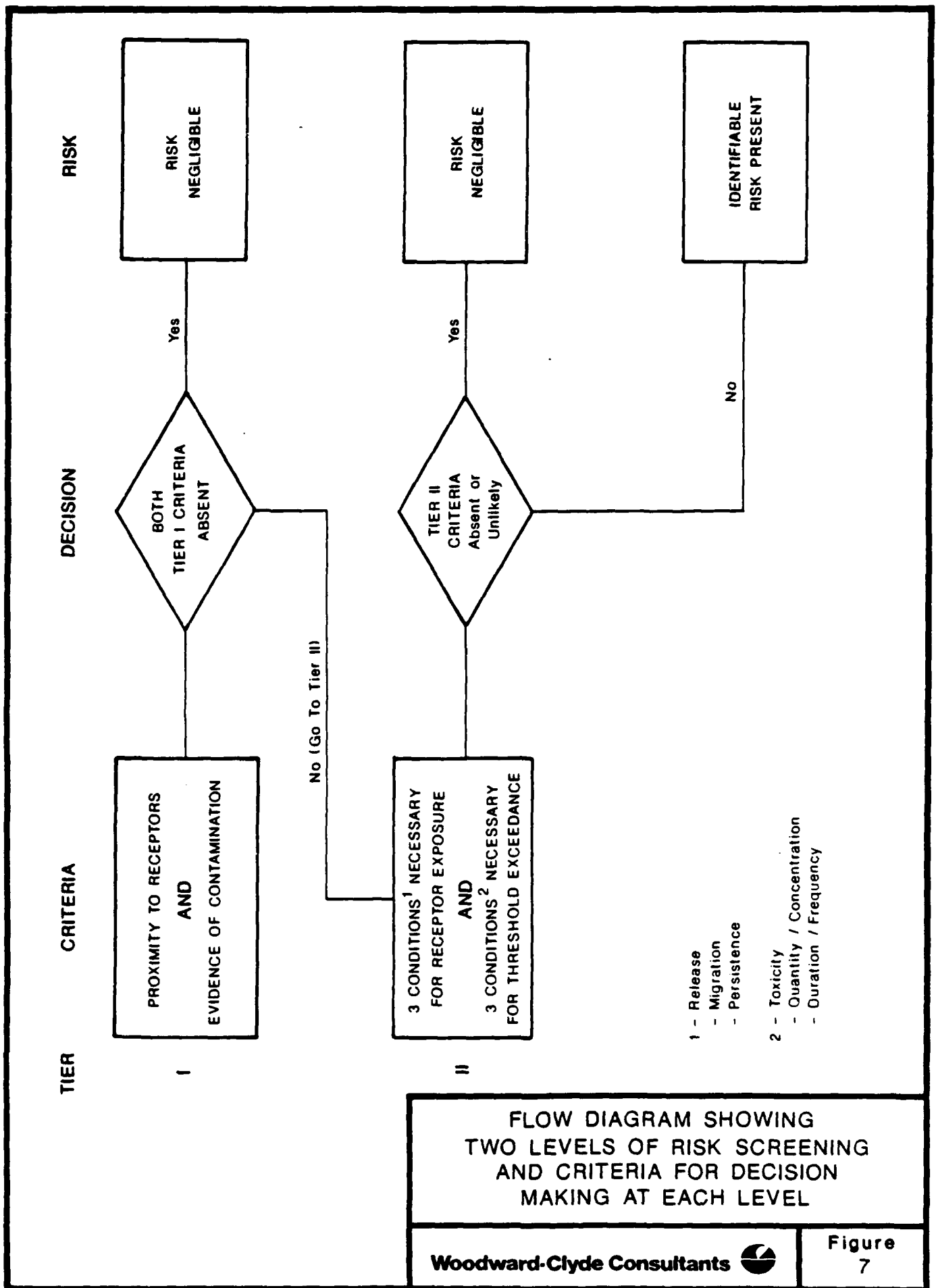
#### 2.5.3 Specific Approach

By the above definition, risk can be either negligible, or present. For those sites assigned a known negligible risk, no

further action will be recommended. For sites where potential risks are present, a preferred remedy will be selected from two or more alternatives. One of these alternatives may be "No Further Action." For no further action to be recommended at a site that has identifiable risks, one of the following conditions must be met:

- o the hazards created by remedial action or further study out-weigh those presently existing at the site, with no further action, or
- o the cost of remedial action or further study is not cost effective.

For the purposes of assigning risk levels to a site, a two-tiered hierarchical decision scheme is employed (see Figure 7). At tier I, an initial screening of the presence of contaminants and the proximity of sensitive receptors is made. This determination is made by reviewing historical records, observations from the site visit, or other evidence. If the available evidence does not indicate that contaminants have been released at the site and if the site is not close to sensitive receptors, then the probability of risk is considered negligible. In this case, a no further action alternative will be recommended. However, if it is concluded that the site is, or possibly has been, contaminated with hazardous or toxic substances, or if the site is in close proximity to sensitive receptors, then screening proceeds to tier II. The approach to tier II is deductive. First, receptors and the conditions necessary for exposure must be identified. Second, the conditions necessary for exceedences of thresholds must be established. Then, the actual conditions at the site are compared to the specified conditions. In actuality, all the specified conditions must



be present for significant risk to exist. However, the risk screening procedure used here is conservative in that it assumes a negligible risk only if all the conditions are absent. If all the necessary conditions are absent, then a negligible risk is clearly deduced. Likewise, if the status of a specified condition cannot be determined at a site but there is no reason to suspect that it exists, and all other conditions are absent, the site will be assumed to have negligible risk. If one or more of the conditions are present or suspected, then the site represents some identifiable level of risk.

#### 2.5.4 Logic Supporting the Assessment

Prior studies identified six sites at Tin City AFS as having the potential to be contaminated with petroleum products, hazardous materials, or other wastes.

For sites 1, 3, 4, 6, 8, and 9 the potential hazards were assessed in Phase I and the recommendation was made for no follow-on action during the Phase II investigations. Sites 2, 5, and 7 are outside the scope of the IRP and are not addressed in this section. For the six sites mentioned above, the conditions necessary to allow exposure of receptors to threshold levels of contamination have been listed in Table 5. Conditions at the sites were compared with hypothetical "necessary conditions" and the conclusions of the risk screening are summarized in Table 5. The rationale for the probability screening for the six sites identified above is provided in the following discussions.

TABLE 5

RISK SCREENING FOR TIN CITY SITES  
TIER I SCREENING - EVIDENCE OF CONTAMINATION AND RECEPTORS

TIER 1 CRITERIA	Site						
	1	3	4	6	8	9	
Is Site in Close Proximity to Sensitive Receptors?	YES	YES	YES	YES	YES	YES	
Is Evidence of Contamination Present at Site?	NO	NO	NO	NO	NO	NO	
Both Criteria Absent?	NO	NO	NO	NO	NO	NO	
Risk	Go to Tier II	Go to Tier II	Go to Tier II	Go to Tier II	Go to Tier II	Go to Tier II	

TABLE 5 cont.

## TIER II SCREENING - EVIDENCE OF CONDITIONS NECESSARY FOR A CONSEQUENCE OF DEFINED MAGNITUDE

TIER II CRITERIA	Site								
	1	3	4	6	8	9			
3 Conditions Necessary for Receptor exposure:									
Significant Release Mechanisms	NO	NO	NO	NO	NO	NO			
Significant Migration Pathways	NO	NO	NO	NO	NO	NO			
High Persistence	NO	NO	NO	NO	NO	NO			
3 Conditions Necessary for Threshold Exceedances:									
Moderate to High Toxicity Relative to Receptors and Likely Routes of Exposure	NO	NO	NO	NO	NO	NO			
Quantity/Concentration Sufficient to Exceed Env., Health, Toxicity Standards	NO	NO	NO	NO	NO	NO			
Duration and Frequency of Exposure Sufficient to Cause Adverse Health/Env. Effects	NO	NO	NO	NO	NO	NO			
All Criteria Absent or Unknown?	YES	YES	YES	YES	YES	YES			
RISK	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE

## Tin City AFS

### 2.5.4.1 Dump No. 1 - Upper Camp (Site 1)

The reported dump at Site 1 has been partially cleaned and restored in 1978 and 1984. No wastes or evidence of contamination were observed in 1987. Because the site is in close proximity to sensitive receptors (Paulina Creek and the Bering Sea), it was screened at tier II. The site was assigned a negligible risk and recommended for no further action.

### 2.5.4.2 Dump No. 2 - Lower Camp (Site 3)

This dump site received mostly metal and construction debris. The area has been recently leveled and regraded and no wastes or contamination were observed in the area. Because of its close proximity to the Bering Sea, Site 3 was screened at tier II. Site 3 was assigned a negligible risk rating and recommended for no further action.

### 2.5.4.3 Waste Accumulation Area - Lower Camp (Site 4)

This area was used to store drummed wastes, unused oils, and ethylene glycol. All of the drummed wastes and oils have been removed, and there is no evidence of spills, leaks, or stains in the area. Because of its close proximity to the Bering Sea, Site 4 was screened at tier II. Site 4 was assigned a negligible risk rating and recommended for no further action.

### 2.5.4.4 Spill/Leak No. 2 - Lower Camp (Site 6)

Site 6 was the location of a previous 300 gallon diesel fuel spill. Although there was no evidence of existing contamination, the site was screened at tier II. Site 6 was assigned a negligible risk rating and recommended for no further action.

## Tin City AFS

### 2.5.4.5 Runway Oiling (Site 8)

Liquid shop wastes were applied to the runway until the 1970's. The site was assigned a HARM rating because of the runway's proximity to Cape Creek and the Bering Sea. There is no evidence of residual contamination at site 8, and the site has been assigned a negligible risk rating and recommended for no further action.

### 2.5.4.6 Mid Mountain Dump (Site 9)

The Mid Mountain Dump was not recognized as a site during the Phase I study but was inspected during the 1987 site visit. The area has been filled and graded, and there is no evidence of contamination. Because of its close proximity to sensitive receptors, a tier II screening was done. However, site 9 was assigned a negligible risk rating, and no further action is recommended.

## 2.6 ALTERNATIVES ANALYSIS

### 2.6.1 Purpose

The Comprehensive Environmental Response and Compensation Liability Act (CERCLA, as amended by the Superfund Amendments and Reauthorization Act--SARA) governs federal agency response to contamination of federal facilities by oil or hazardous substances. The National Contingency Plan (40 CFR 300) calls for cost-effective remedies to be implemented for sites where a significant risk to human health or the environment is shown to exist. Such sites are enrolled on the "National Priority List" (called NPL). Guidance for selecting cost-effective remedies for NPL sites is available in EPA documents EPA/540/G-85/003, "Guidance for Feasibility Studies Under CERCLA" and EPA memorandum "Interim Guidance on Superfund

Selection of Remedy" (Porter, 10/24/86). No specific guidance exists for selecting cost-effective remedies for non-NPL sites such as those at Tin City. The alternatives analysis presented in the following paragraphs is modeled after the above-referenced EPA guidance, and it is in compliance with the requirements of the National Contingency Plan.

#### 2.6.2 Evaluation Criteria and Method

EPA directives, ("Guidance for Feasibility Studies Under CERCLA and Guidance on Superfund Selection of Remedy) provide an evaluation method for alternative remedies that includes the following evaluation criteria:

- o Remedies must be protective of human health and the environment;
- o Remedies should attain Federal and State public health and environmental requirements;
- o Remedies must be cost effective; and
- o Remedies must utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent possible.

To meet these standards, the following evaluation criteria are presented:

- o Performance level (how effective will the alternative be in abating the hazard, and in reducing risk);
- o Useful life (how long will the alternative last);

Tin City AFS

- o Risk of increased exposure (will the alternative create new opportunities for receptors to be exposed to contaminants);
- o Environmental impact (will the alternative cause disturbance or loss of environmental resources);
- o Cost (Rough, Order-of-Magnitude cost is used: is the economic cost of the alternative low, moderate or high);
- o Implementability (what infrastructural, administrative or logistic requirements does the alternative have);
- o Institutional impacts (does the alternative place a burden on local community institutions);
- o Socioeconomic impacts (does the alternative affect employment, housing, or other socioeconomic factors);
- o Safety (what is the health risk to site workers and surrounding residents of the alternative remedial measure);
- o Reliability (what are the maintenance, inspection and replacement requirements of the alternatives).

The last four evaluation factors are not specifically addressed in the evaluation below for the following reasons: institutional factors are not relevant because no local community institutions or interactions are involved; socioeconomic impacts are not relevant because the sites are not economically interactive with local communities; the remedial alternatives considered are relatively specialized and would not present employment or income opportunities to local communities.

## Tin City AFS

Safety impacts are not relevant because none of the known or potential contamination problems, and none of the alternative actions present a significant risk to workers or residents of the sites. Reliability is generally not a relevant factor because none of the alternatives are active treatment systems or have any maintenance or replacement requirement. Finally, these factors are not specifically addressed and indirectly considered in the other factors. For example, reliability is partially considered under Useful Life and Performance Level.

The first six evaluation factors (described above) will be applied to each alternative at each site, using a tabular format with the following headings:

- o Alternative;
- o Performance Level;
- o Useful Life;
- o Risk of Increased Exposure;
- o Environmental Impact;
- o Rough Order of Magnitude (ROM) Cost;
- o Implementability.

The alternatives will be ranked based on a qualitative scoring that considers performance level, useful life and risk of increased exposure to be relatively more important than environmental impact. Environmental impact will be considered to be relatively more important than ROM cost and implementability.

## Tin City AFS

### 2.6.3 Alternatives to be Evaluated

At least three alternative actions were considered at each of the five sites evaluated at tier II in the risk screening. These sites were evaluated at tier II because of the proximity of the sites to the Bering Sea or other sensitive receptors. These alternative actions are presented below for each of the five sites.

#### 2.6.3.1 Dump No. 1 - Upper Camp (Site 1)

- o No further action;
- o Further investigation of the site consisting of test borings and sampling and analysis of soils to determine the extent of potential chemical contamination;
- o Further investigation followed by excavation and removal of potentially contaminated soils.

#### 2.6.3.2 Dump No. 2 - Lower Camp (Site 3)

- o No further action;
- o Further investigation of the site consisting of test borings and sampling and analysis of soils to determine the extent of potential chemical contamination;
- o Further investigation followed by excavation and removal of potentially contaminated soils.

#### 2.6.3.3 Waste Accumulation area - Lower Camp Area (Site 4)

- o No further action;

## Tin City AFS

- o Further investigation of the site consisting of test borings and sampling and analysis of soils to determine the extent of potential chemical contamination by oil and ethylene glycol;
- o Further investigation followed by excavation and removal of potentially contaminated soils.

### 2.6.3.4 Spill/Leak No. 2 - Lower Camp (Site 6)

- o No further action;
- o Further investigation of the site consisting of test borings and sampling and analysis of soils to determine the extent of potential chemical contamination by diesel;
- o Further investigation followed by excavation and removal of potentially contaminated soils.

### 2.6.3.5 Runway Oiling (Site 8)

- o No further action;
- o Further investigation of the site consisting of test borings and sampling and analysis of soils to determine the extent of potential chemical contamination by oils and hydraulic fluids;
- o Further investigation followed by excavation and removal of potentially contaminated soils.

### 2.6.3.6 Mid Mountain Dump (Site 9)

- o No further action;

## Tin City AFS

- o Further investigation of the site consisting of test borings and sampling and analysis of soils to determine the extent of potential chemical contamination;
- o Further investigation followed by excavation and removal of potentially contaminated soils.

### 2.6.4 Results

The following results are presented for each site evaluated in tier II screening in table format as described in section 2.6.2 of this report. The preferred alternative for each site is no action.

2.6.4.1 Dump No. 1 - Upper Camp (Site 1)

Alternative	Performance Level	Useful Life	Risk of Increased Exposure	Environ. Impact	ROM Cost	Implement-ability
No Action	Low	High	Negligible	Negligible	Negligible	Good
Investigation	Low	High	Low	Moderate	High	Poor
Investigation/ Excavation	Low/High	Low/High	Low	Moderate	High	Poor

Preferred Alternative: No Action

2.6.4.2 Dump No. 2 - Lower Camp (Site 3)

Alternative	Performance Level	Useful Life	Risk of Increased Exposure	Environ. Impact	ROM Cost	Implement-ability
No Action	Low	High	Negligible	Negligible	Negligible	Good
Investigation	Low	High	Low	Moderate	High	Poor
Investigation/ Excavation	Low/High	Low/High	Low	Moderate	High	Poor

Preferred Alternative: No Action

#### 2.6.4.3 Waste Accumulation Area - Lower Camp (Site 4)

Alternative	Performance Level	Useful Life	Risk of Increased Exposure	Environ. Impact	ROM Cost	Implement-ability
No Action	Low	High	Negligible	Negligible	Negligible	Good
Investigation	Low	High	Low	Moderate	High	Poor
Investigation/ Excavation	Low/High	Low/High	Low	Moderate	High	Poor

Preferred Alternative: No Action

#### 2.6.4.4 Spill/Leak No. 2 - Lower Camp (Site 6)

Alternative	Performance Level	Useful Life	Risk of Increased Exposure	Environ. Impact	ROM Cost	Implement-ability
No Action	Low	High	Negligible	Negligible	Negligible	Good
Investigation	Low	High	Low	Moderate	High	Poor
Investigation/ Excavation	Low/High	Low/High	Low	Moderate	High	Poor

Preferred Alternative: No Action

#### 2.6.4.5 Runway Oiling (Site 8)

Alternative	Performance Level	Useful Life	Risk of Increased Exposure	Environ. Impact	ROM Cost	Implement-ability
No Action	Low	High	Negligible	Negligible	Negligible	Good
Investigation	Low	High	Low	Moderate	High	Poor
Investigation/ Excavation	Low/High	Low/High	Low	Moderate	High	Poor

Preferred Alternative: No Action

## 2.7 SUMMARY

All of the sites considered in the risk screening were evaluated at the Tier II level. The no action alternative is the preferred alternative because it presents the lowest or same risk to human health as other alternatives. The no action alternative also has a lower environmental and economic cost than any other alternative at each of the sites.

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